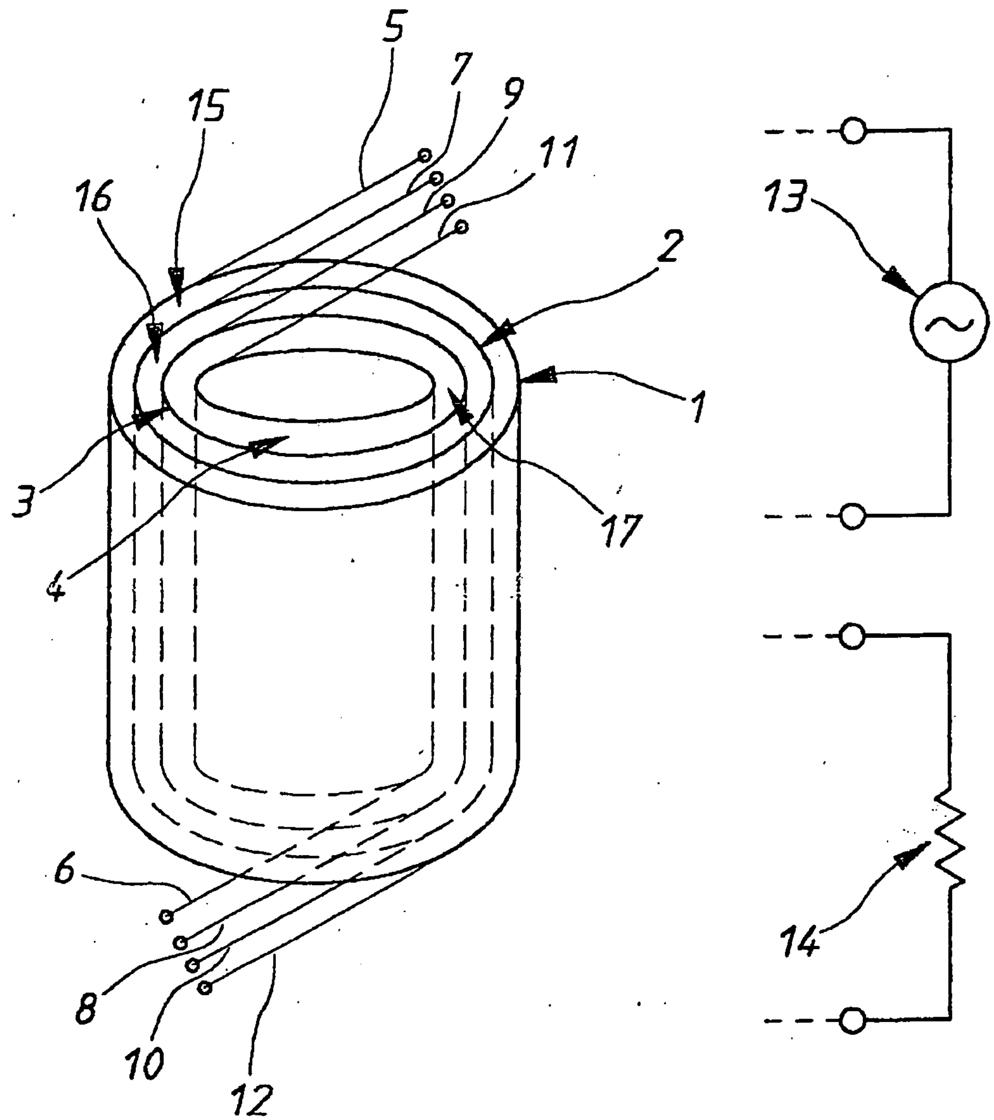


FIG. 1

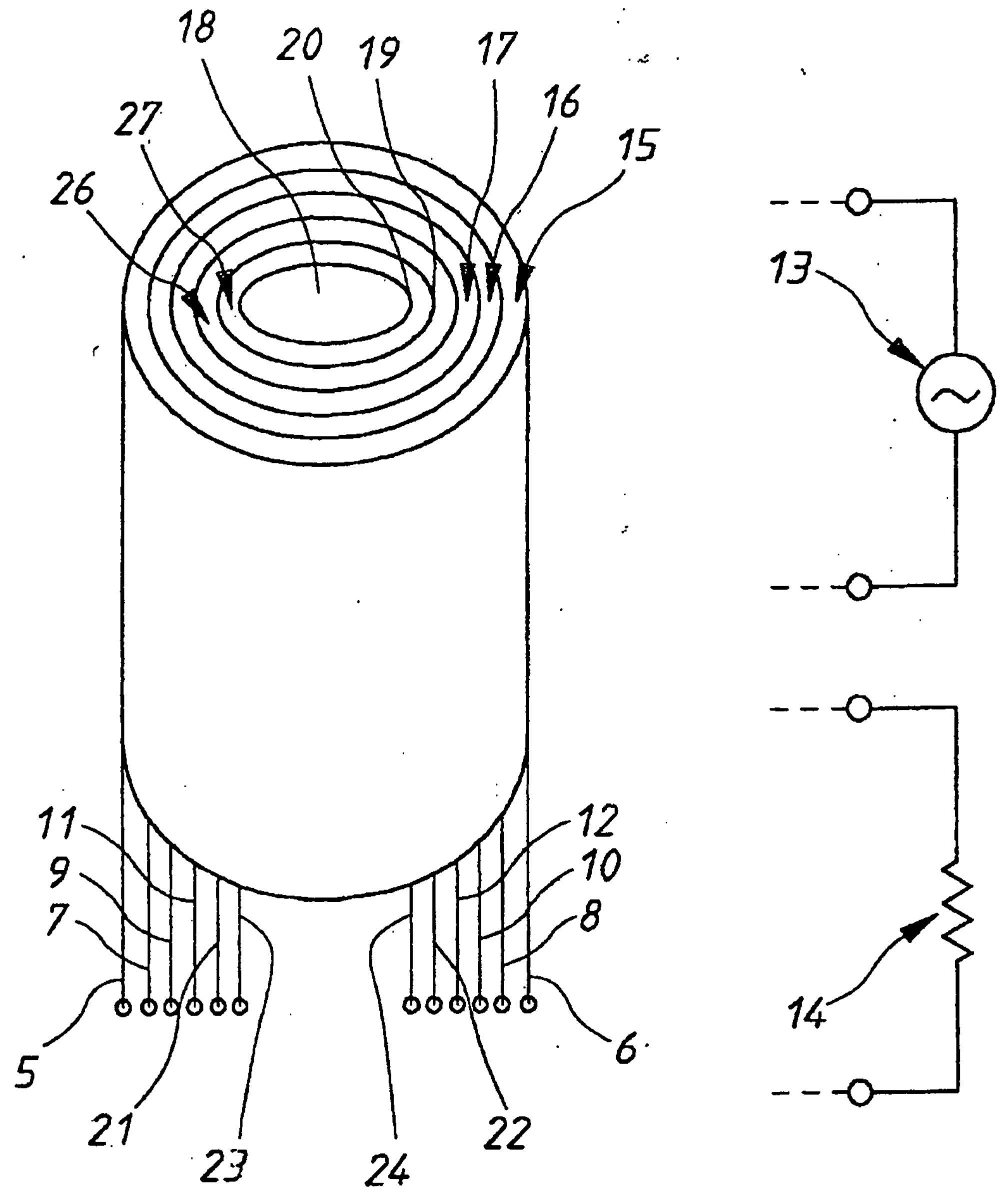


FIG.2

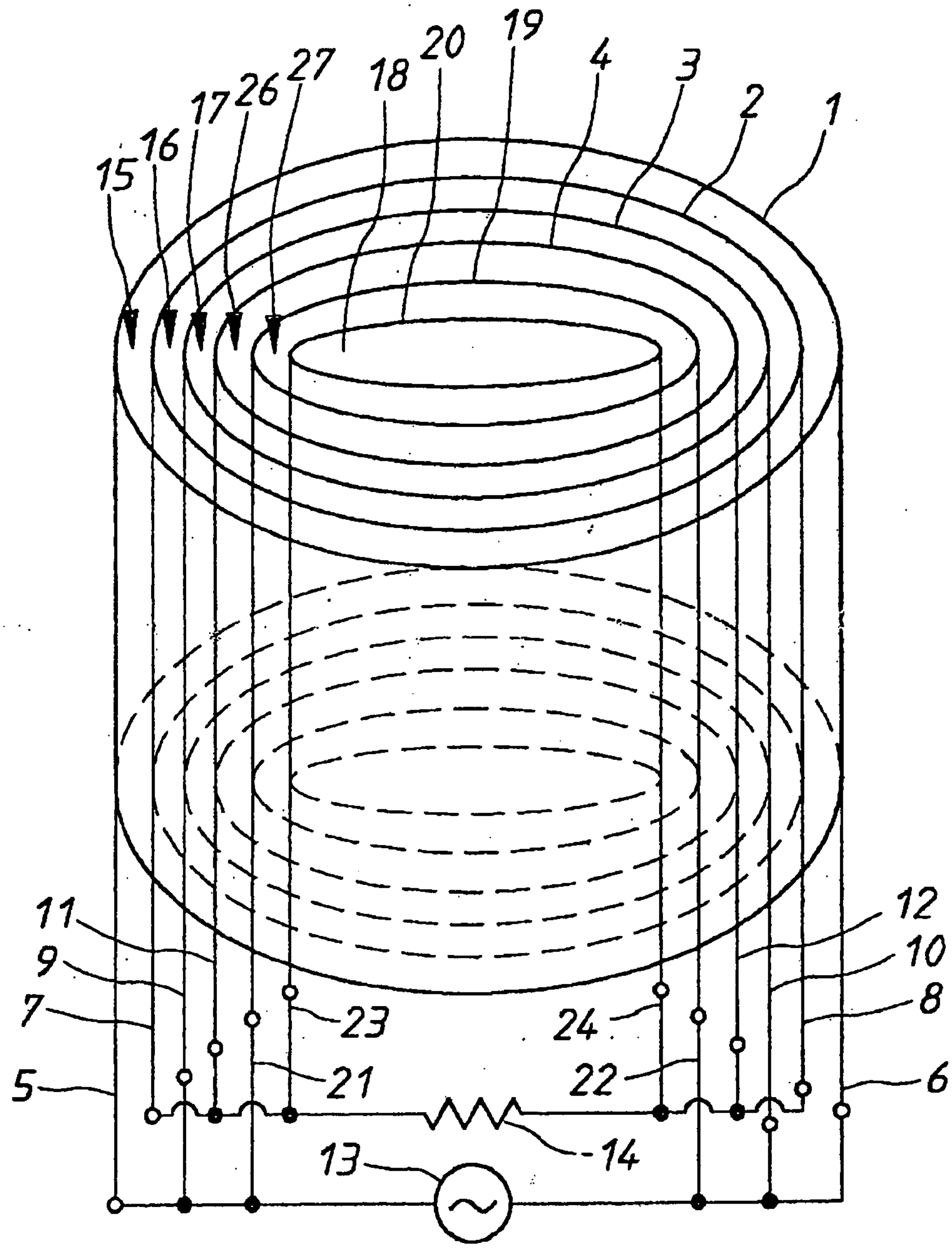


FIG.3

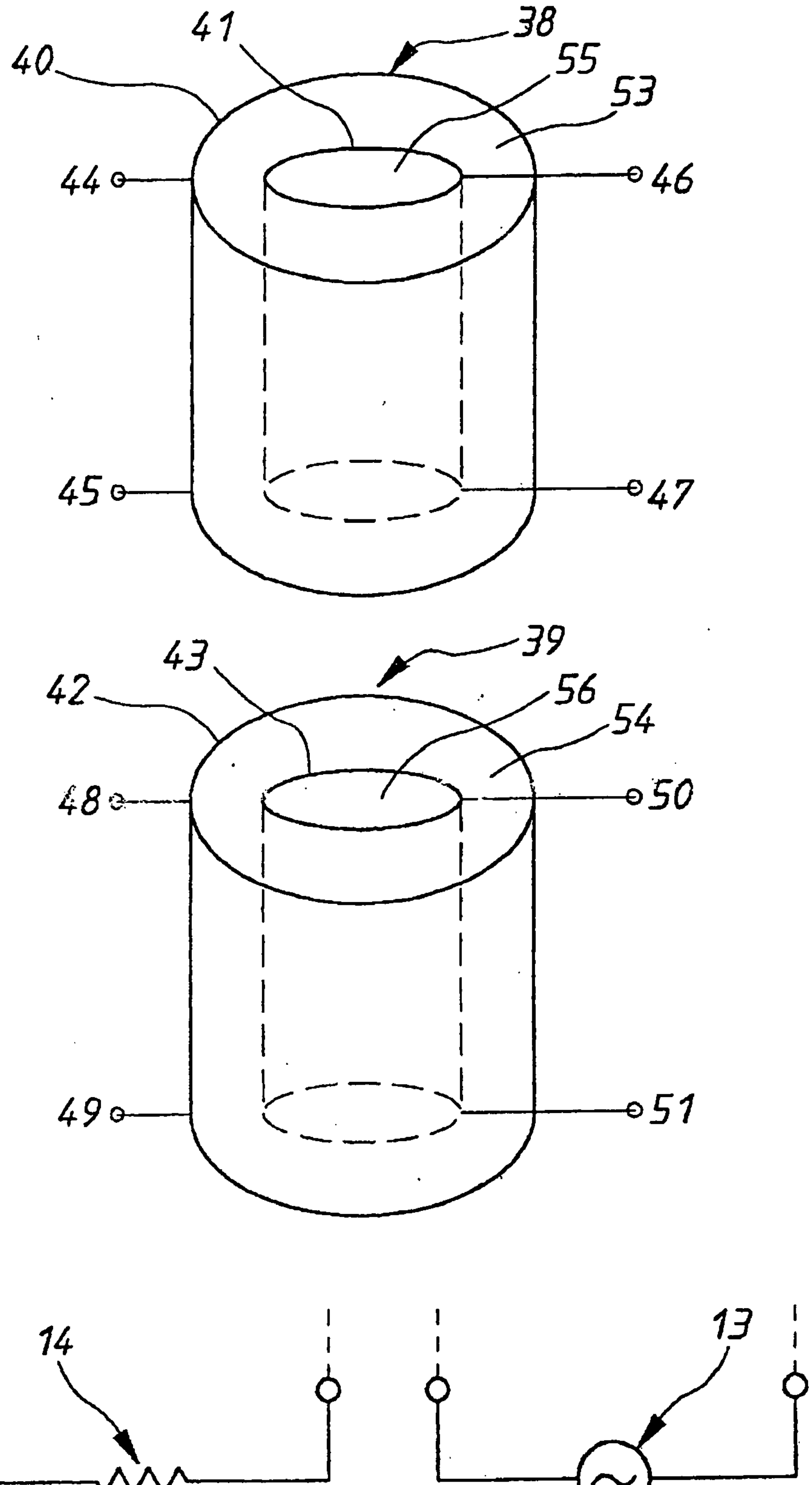


FIG.4

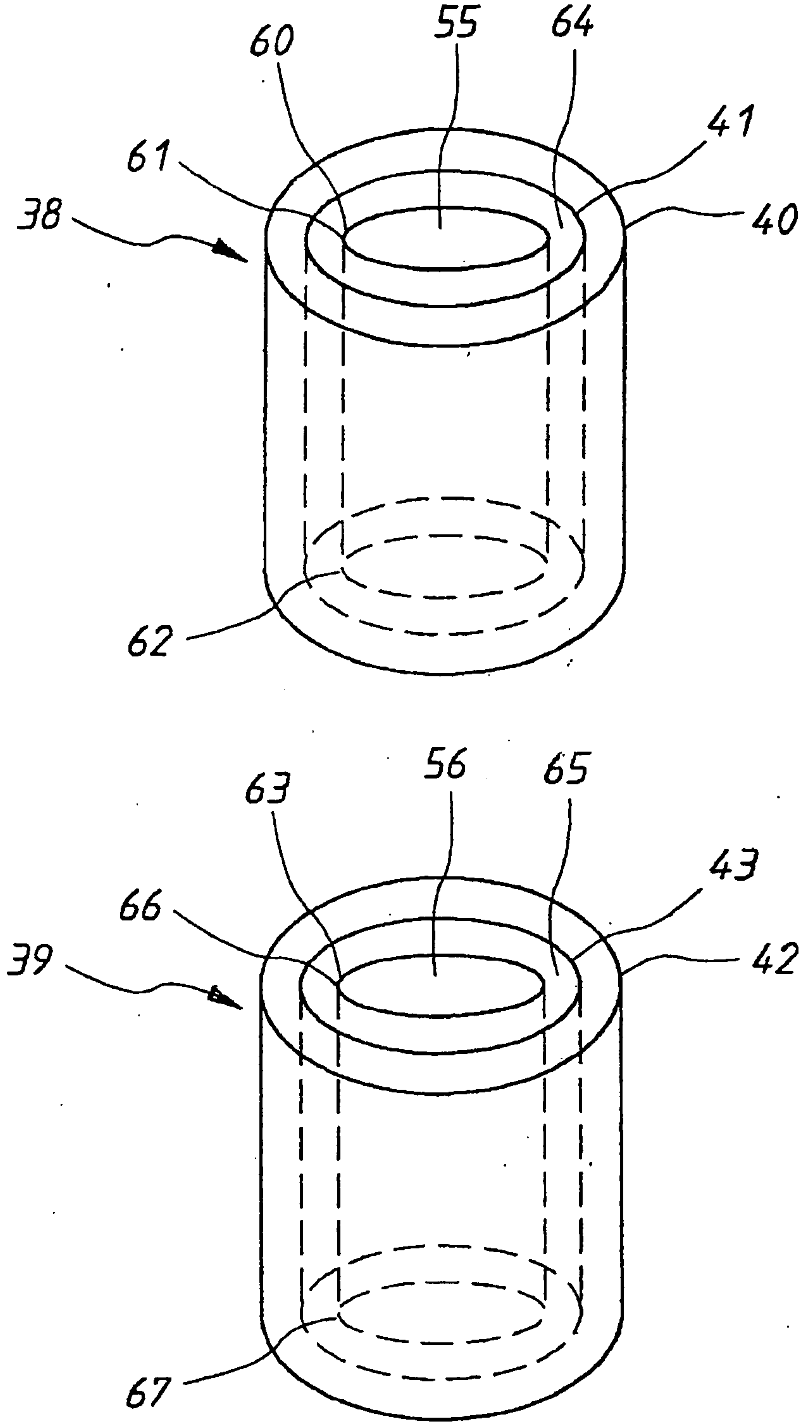
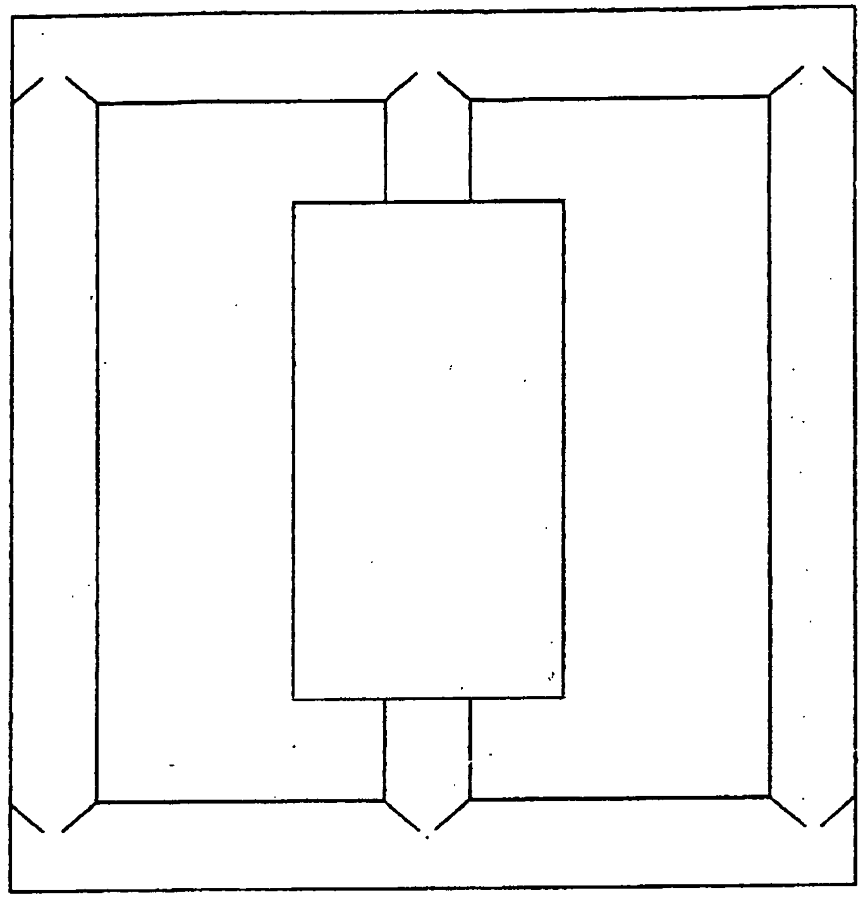


FIG.5



"2500 m 2:1 core 1.75 T"

Rating 100 kVA, 6.6 kV/240 V Star:Star

5.1 A Primary AC current

140 A Secondary AC current

Core Type	Limb Length = 0.496 m	Primary coil loss = 25 Watts (calculated) (5 W if twisted)
Acore = 0.0052 m^2	Yoke Length = 0.5909 m	Estimated Secondary coil loss = 25 Watts (5 W if twisted)
Dcore = 0.081 m	Imag ~ 0.1 Amps	Core loss = 150 W (1.5 W/kg)
IDS = 0.1413 m	Np = 3628 Turns	3 phase coil losses = 150 Watts (30 W twisted)
ODs = 0.1518 m	Ns = 132 Turns	Including cryogenic cost = ca 1500 watts (300 W if twisted)
IDp = 0.1718	Ip = 5.1 A rms	Total losses = 1650 Watts (450 W if twisted) (1000 W conventionally)
ODp = 0.1891	Is = 140 A rms	
Hp = Hs = 0.406 m	Ps = 10 (Secondary Pancakes)	3Ph efficiency = 98.35 % (99.55 % if twisted)
3f Vol = 102 litres	Pp = 147 (Primary Pancakes)	

FIG.6

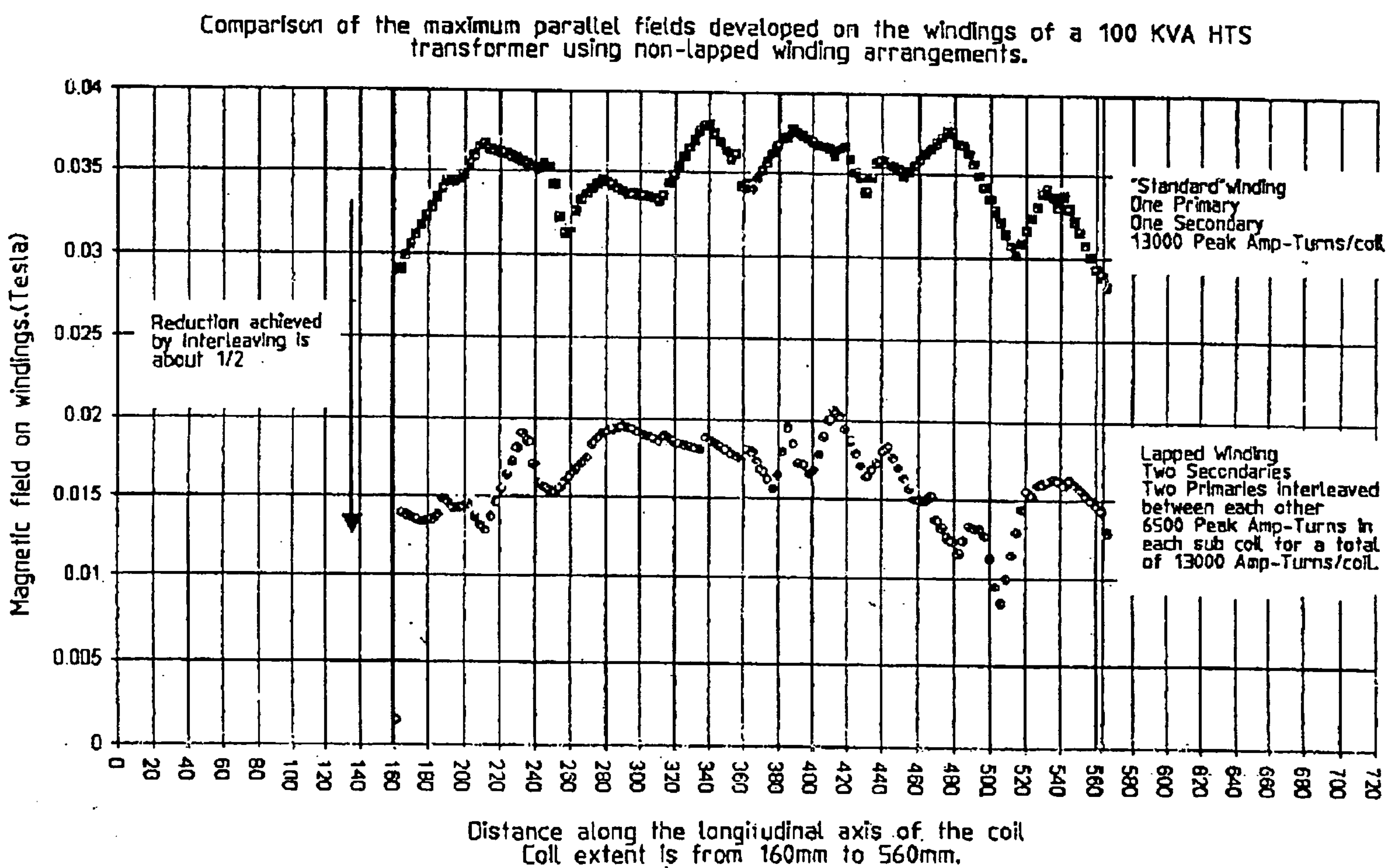

Comparison of the maximum parallel fields developed on the windings of a 100 KVA HTS transformer using non-lapped winding arrangements.
Magnetic field on windings.(Tesla)
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340 360 380 400 420 440 460 480 500 520 540 560 580 600 620 640 660 680 700 720
Reduction achieved by interleaving is about 1/2
"Standard" winding
One Primary
One Secondary
13000 Peak Amp-Turns/coil
Lapped Winding
Two Secondaries
Two Primaries interleaved between each other
6500 Peak Amp-Turns in each sub coil for a total of 13000 Amp-Turns/coil.
Distance along the longitudinal axis of the coil
Coil extent is from 160mm to 560mm.

FIG.7

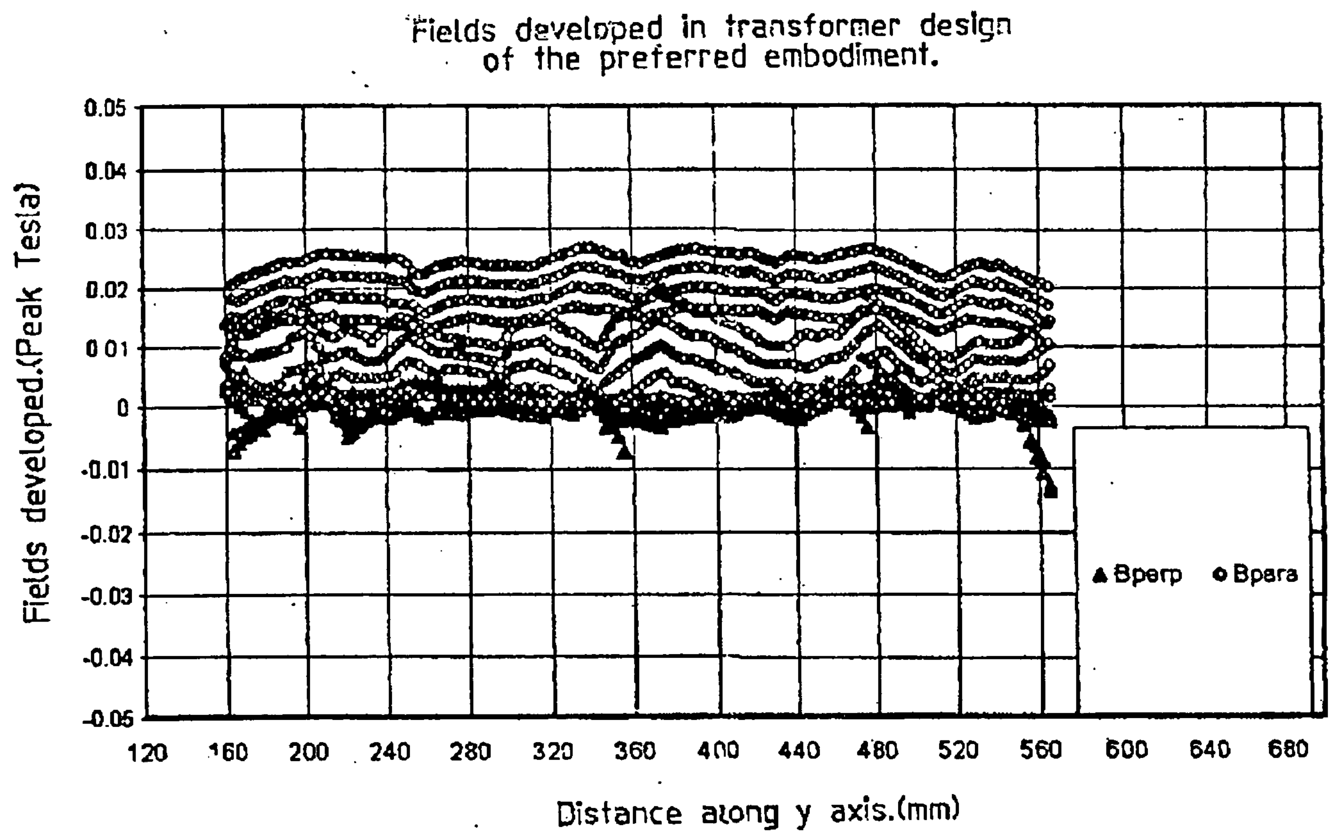

Fields developed in transformer design
of the preferred embodiment.
0.05
0.04
0.03
0.02
0.01
0
-0.01
-0.02
-0.03
-0.04
-0.05
Fields developed.(Peak Tesla)
120
160
200
240
280
320
360
400
440
480
520
560
600
640
680
Distance along y axis.(mm)
Bperp
Bpara

FIG.8

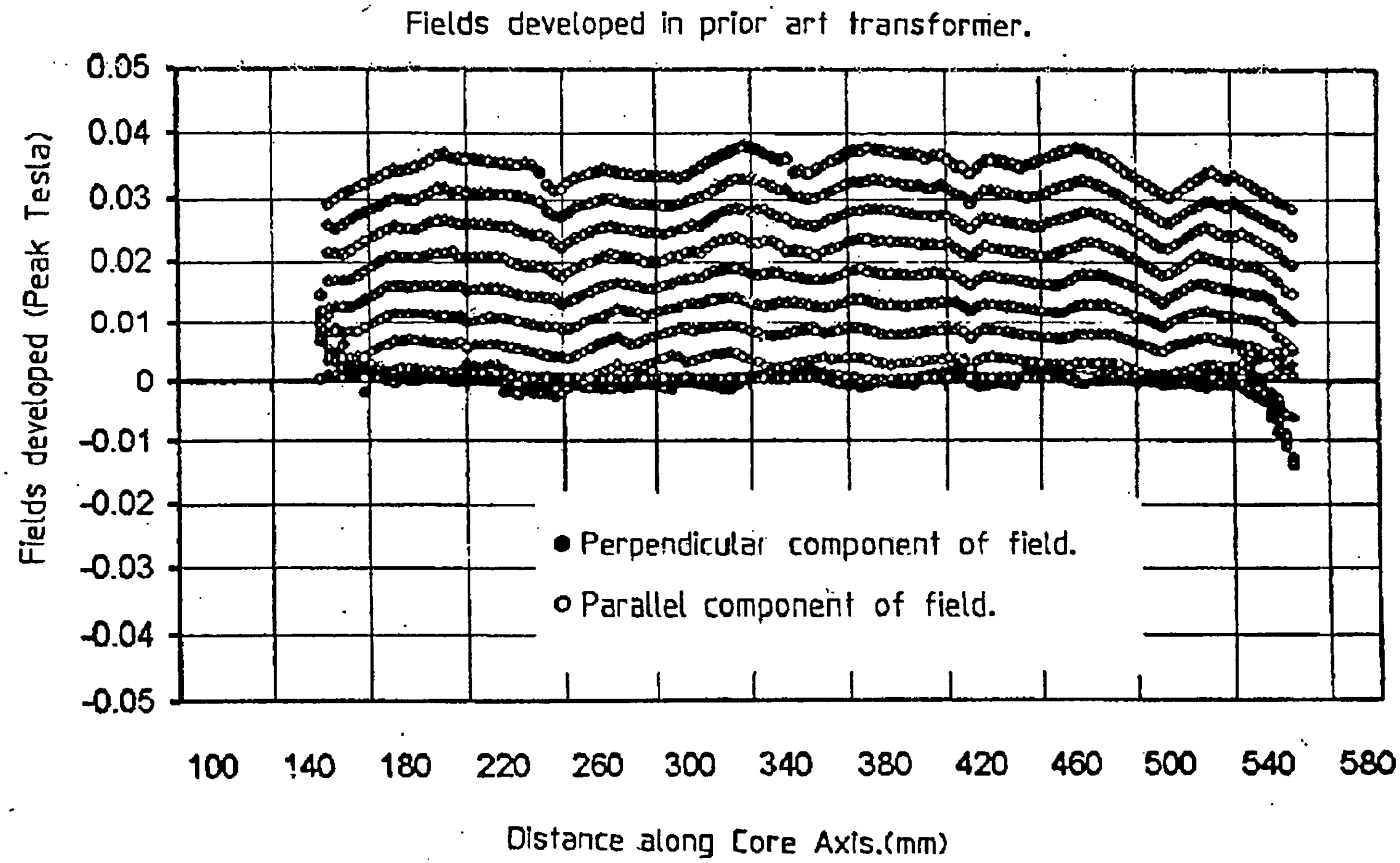
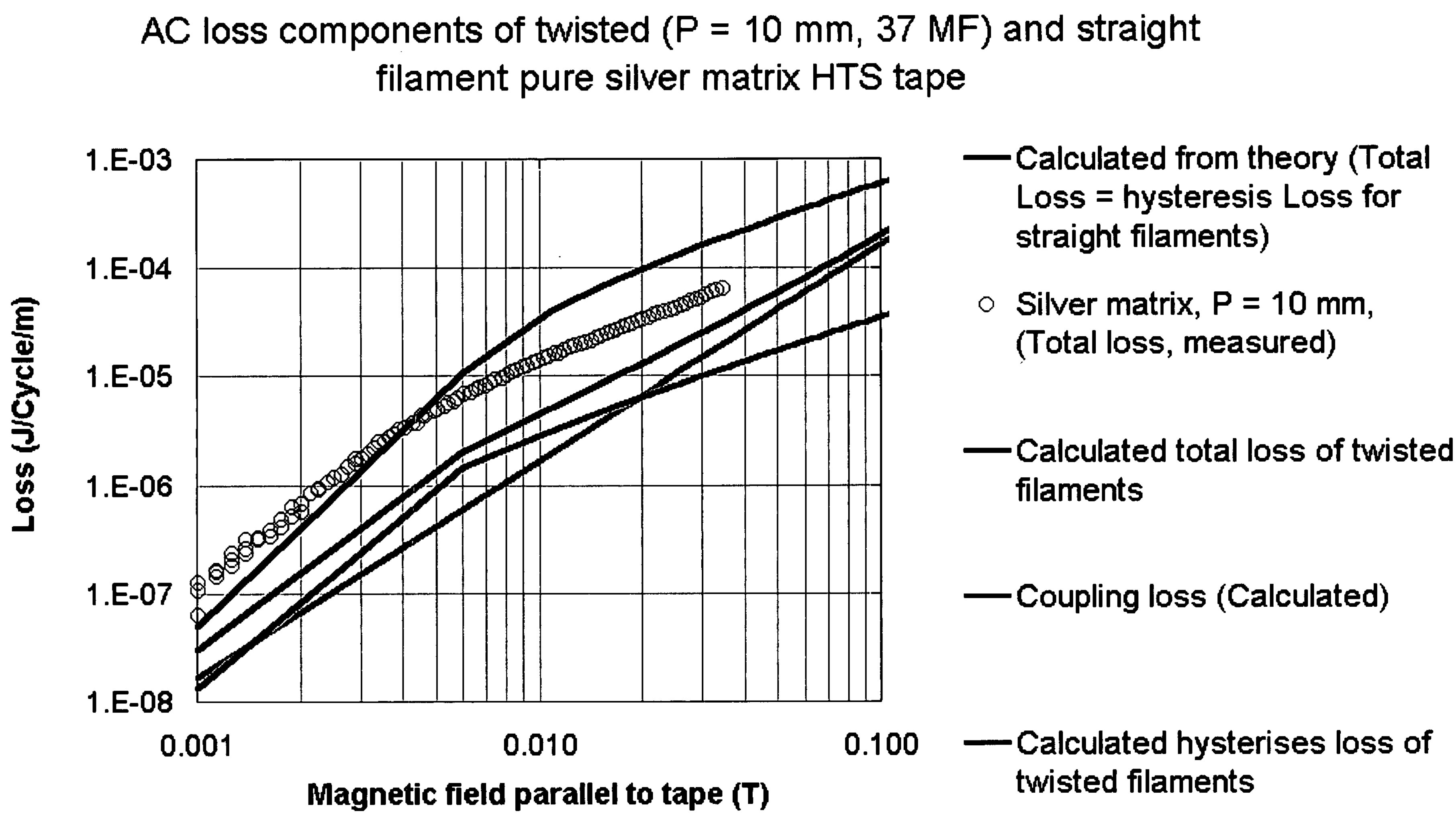

Fields developed in prior art transformer.
Fields developed (Peak Tesla)
0.05
0.04
0.03
0.02
0.01
0
-0.01
-0.02
-0.03
-0.04
-0.05
100
140
180
220
260
300
340
380
420
460
500
540
580
Distance along Core Axis.(mm)
Perpendicular component of field.
Parallel component of field.

FIG.9

Figure 10(a)



AC loss components of twisted (P = 10 mm, 37 MF) and straight filament pure silver matrix HTS tape
Loss (J/Cycle/m)
1.E-03
1.E-04
1.E-05
1.E-06
1.E-07
1.E-08
0.001
0.010
0.100
Magnetic field parallel to tape (T)
Calculated from theory (Total Loss = hysteresis Loss for straight filaments)
Silver matrix, P = 10 mm, (Total loss, measured)
Calculated total loss of twisted filaments
Coupling loss (Calculated)
Calculated hysterises loss of twisted filaments

Figure 10(b)

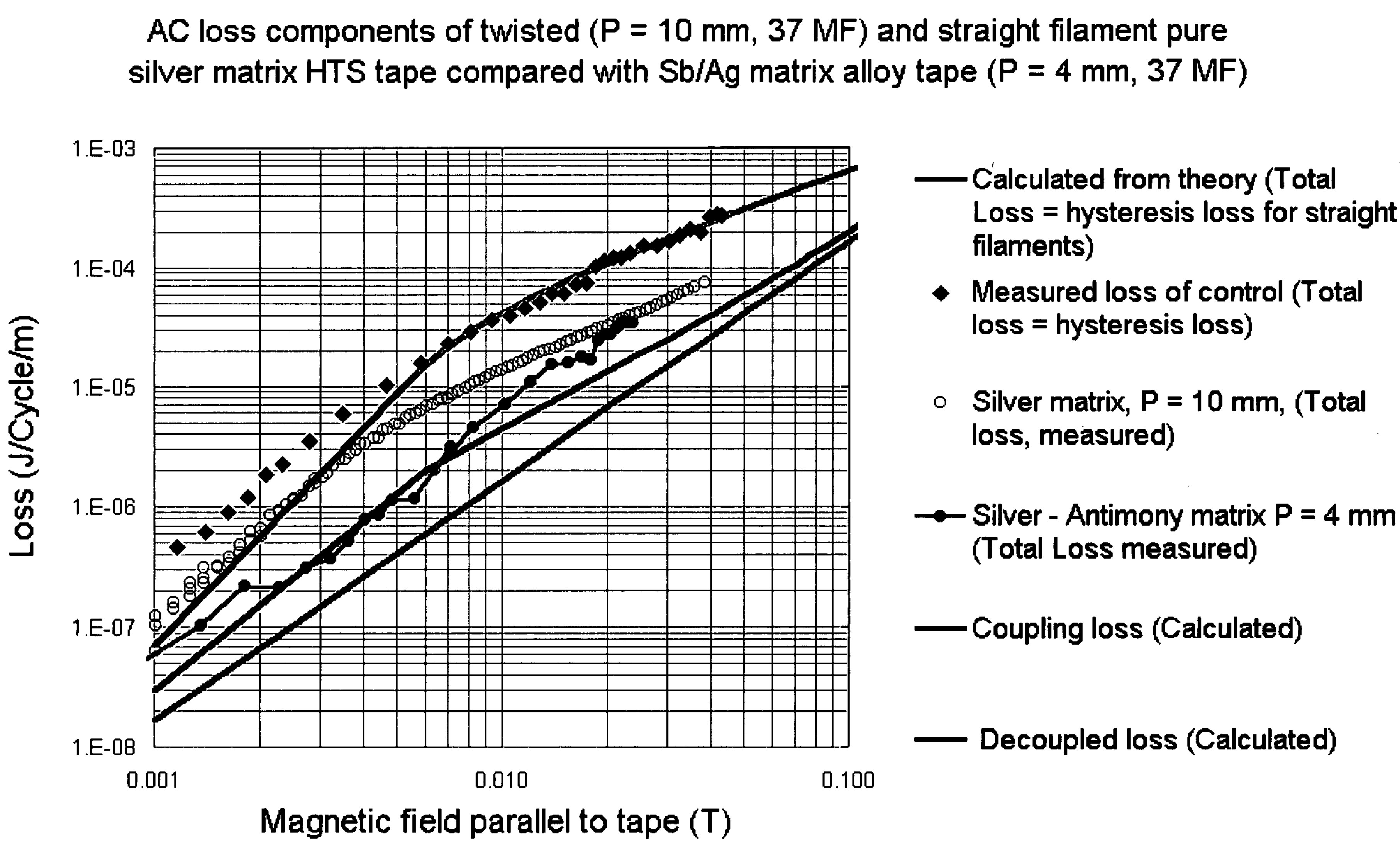
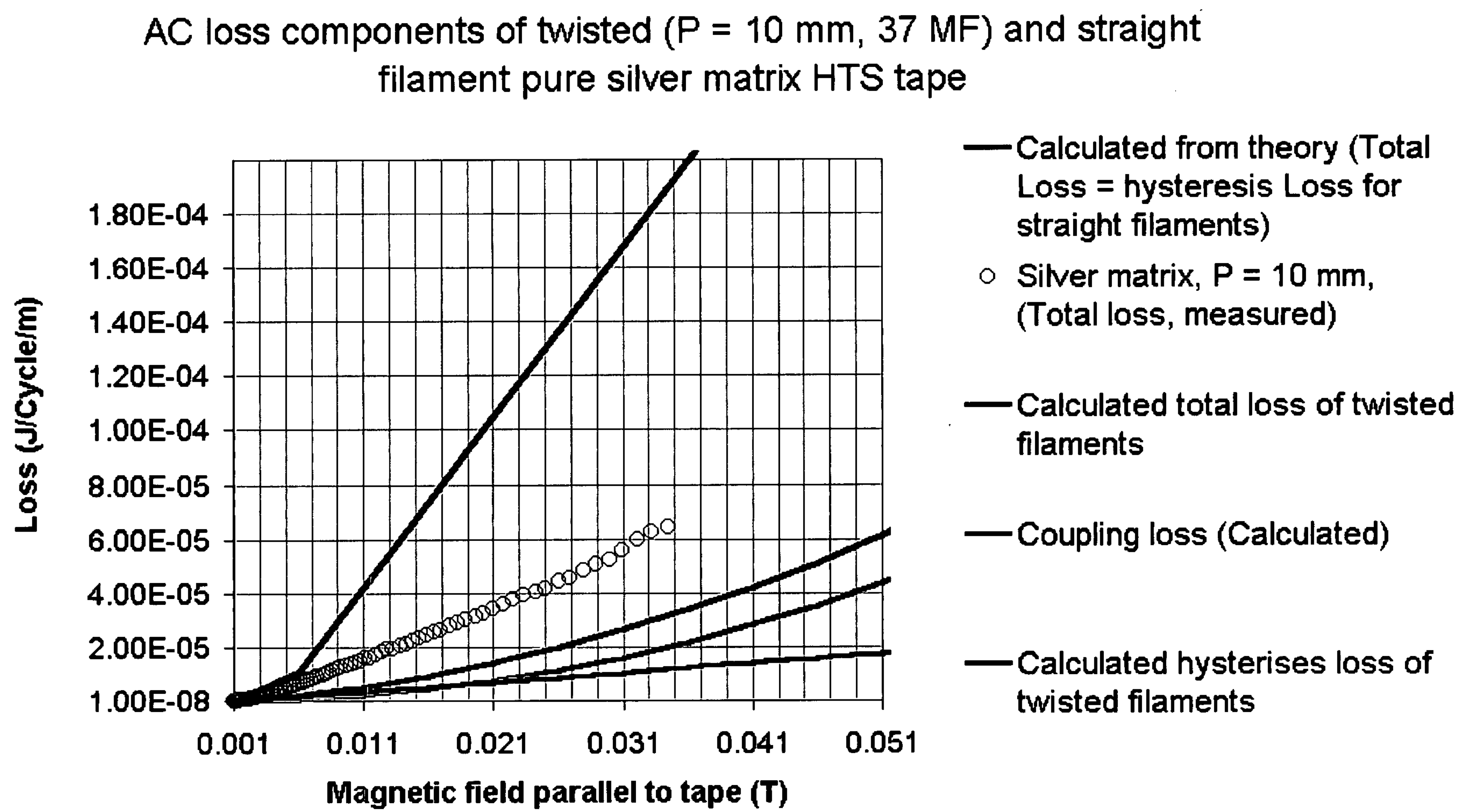

AC loss components of twisted (P = 10 mm, 37 MF) and straight filament pure silver matrix HTS tape compared with Sb/Ag matrix alloy tape (P = 4 mm, 37 MF)
Loss (J/Cycle/m)
1.E-03
1.E-04
1.E-05
1.E-06
1.E-07
1.E-08
0.001
0.010
0.100
Magnetic field parallel to tape (T)
Calculated from theory (Total Loss = hysteresis loss for straight filaments)
Measured loss of control (Total loss = hysteresis loss)
Silver matrix, P = 10 mm, (Total loss, measured)
Silver - Antimony matrix P = 4 mm (Total Loss measured)
Coupling loss (Calculated)
Decoupled loss (Calculated)

Figure 10(c)



AC loss components of twisted (P = 10 mm, 37 MF) and straight filament pure silver matrix HTS tape
Loss (J/Cycle/m)
1.80E-04
1.60E-04
1.40E-04
1.20E-04
1.00E-04
8.00E-05
6.00E-05
4.00E-05
2.00E-05
1.00E-08
0.001
0.011
0.021
0.031
0.041
0.051
Magnetic field parallel to tape (T)
Calculated from theory (Total Loss = hysteresis Loss for straight filaments)
Silver matrix, P = 10 mm, (Total loss, measured)
Calculated total loss of twisted filaments
Coupling loss (Calculated)
Calculated hysterises loss of twisted filaments

Figure 10(d)

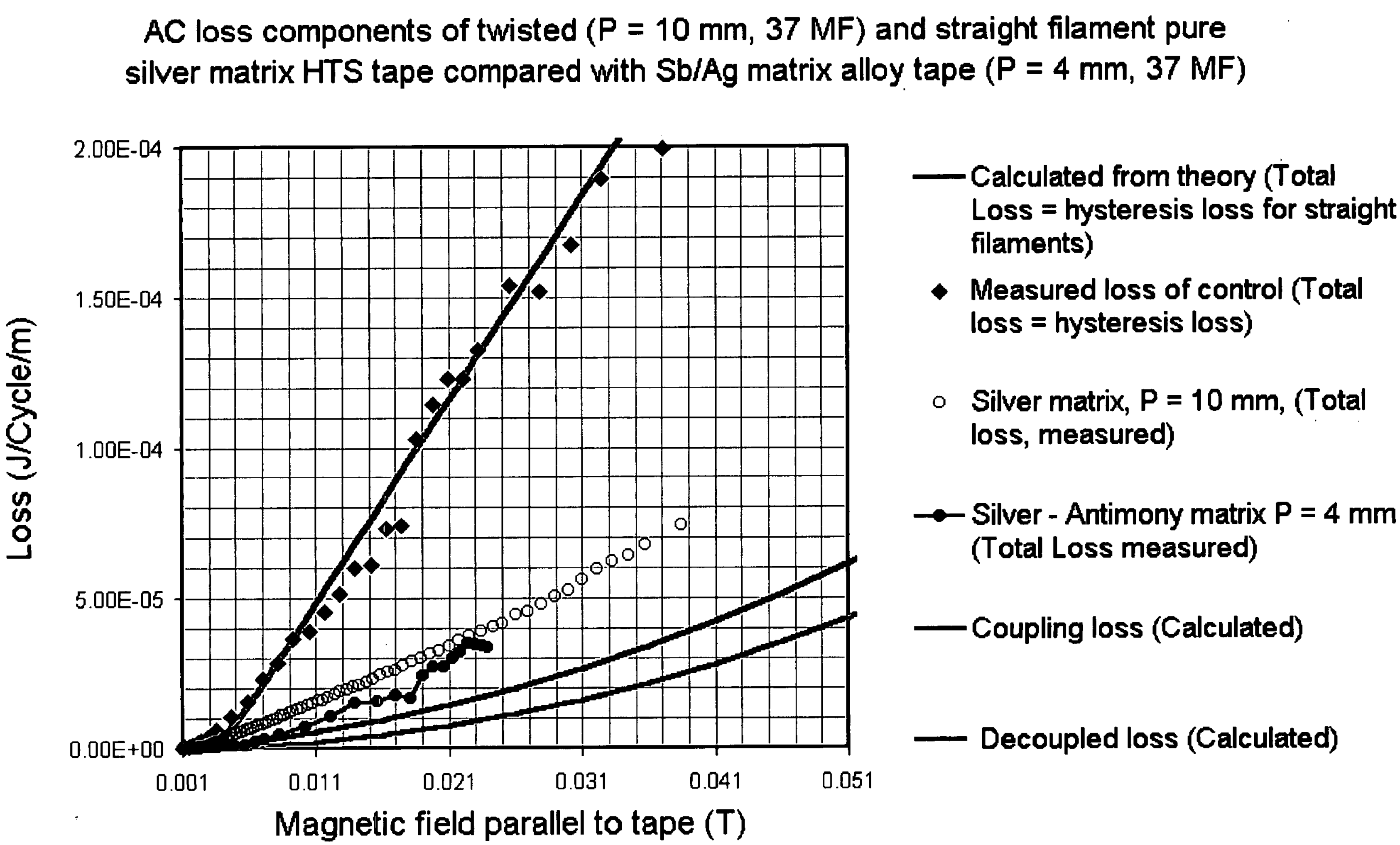
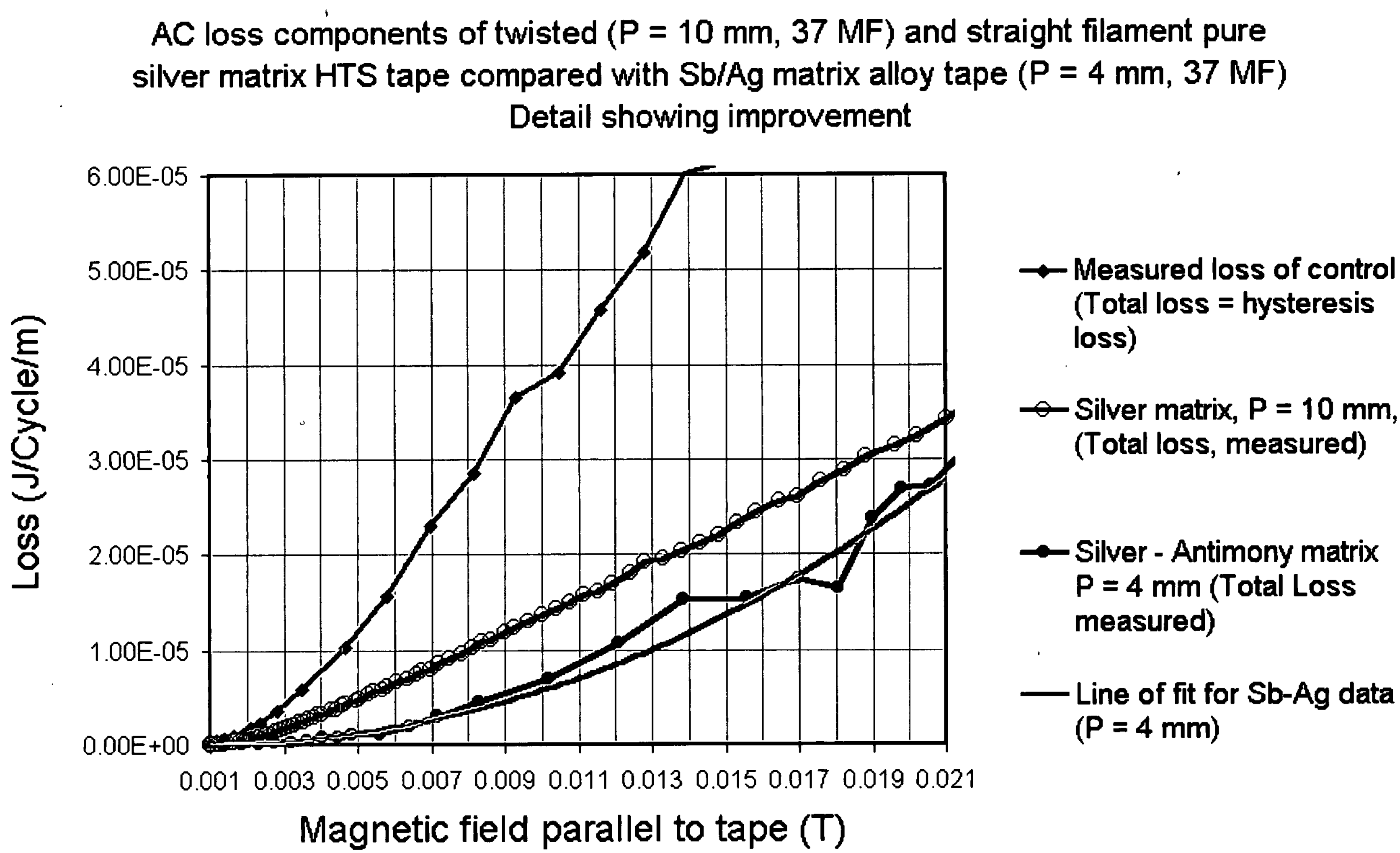

AC loss components of twisted (P = 10 mm, 37 MF) and straight filament pure silver matrix HTS tape compared with Sb/Ag matrix alloy tape (P = 4 mm, 37 MF)
Loss (J/Cycle/m)
2.00E-04
1.50E-04
1.00E-04
5.00E-05
0.00E+00
0.001
0.011
0.021
0.031
0.041
0.051
Magnetic field parallel to tape (T)
Calculated from theory (Total Loss = hysteresis loss for straight filaments)
Measured loss of control (Total loss = hysteresis loss)
Silver matrix, P = 10 mm, (Total loss, measured)
Silver - Antimony matrix P = 4 mm (Total Loss measured)
Coupling loss (Calculated)
Decoupled loss (Calculated)

Figure 10(e)



AC loss components of twisted (P = 10 mm, 37 MF) and straight filament pure silver matrix HTS tape compared with Sb/Ag matrix alloy tape (P = 4 mm, 37 MF)
Detail showing improvement
Loss (J/Cycle/m)
6.00E-05
5.00E-05
4.00E-05
3.00E-05
2.00E-05
1.00E-05
0.00E+00
0.001 0.003 0.005 0.007 0.009 0.011 0.013 0.015 0.017 0.019 0.021
Magnetic field parallel to tape (T)
Measured loss of control (Total loss = hysteresis loss)
Silver matrix, P = 10 mm, (Total loss, measured)
Silver - Antimony matrix P = 4 mm (Total Loss measured)
Line of fit for Sb-Ag data (P = 4 mm)